

Monte Carlo simulation of correlated electronic liquid crystalline phases

Orion Ciftja

Department of Physics, Prairie View A&M University, Prairie View, Texas 77446, USA

Strongly correlated electronic systems especially those in two dimensions exhibit some of the most intriguing phenomena in condensed matter physics. Strong interactions can drive such systems into novel electronic quantum phases that cannot be described by standard paradigms. Understanding how novel quantum phases stabilize and simulating their properties is one of the biggest challenges in condensed matter physics. Therefore, computational studies of novel unconventional correlated quantum phases of electrons are a topic of great interest. In this work we present Monte Carlo simulation results for strongly correlated electronic liquid crystalline phases observed at certain even-denominator filling factors of quantum Hall liquid states. The anisotropic electronic liquid crystalline phases are described by a broken rotational symmetry wave function. Monte Carlo energy simulations of systems of electrons in disk geometry indicate that such an exotic anisotropic liquid crystalline quantum Hall phase with broken rotational symmetry is more energetically favored than an isotropic one depending on the nature of the effective interaction potential.